

sub c1 3. In a cannula sized for insertion in a human body, the cannula having a distal end and a proximal end and a substantially cylindrical outer wall defining a lumen along a longitudinal axis thereof, in which the lumen is sized to receive a movable cutting member therethrough, the improvement comprising an opening defined adjacent the distal end through the outer wall communicating with the lumen, said opening having opposite edges extending along [substantially parallel to] the longitudinal axis, at least one [each] of said edges defining at least one tooth arranged to engage tissue [surrounding the cannula] drawn into said opening when the cannula is inserted into a body.

Please add the following new claims 14-78:

sub 14. The tissue cutting device of claim 1 further comprising a cutting board disposed at said distal end of said outer cannula.--

a2 --15. The tissue cutting device of claim 14 wherein said cutting board is formed of a resilient plastic material having a hardness less than a hardness of said inner cannula at said cutting edge, but sufficient to substantially prevent permanent deformation of said cutting board under pressure from said cutting edge as said inner cannula rotates and reciprocates against said cutting board.--

--16. The tissue cutting device of claim 1 wherein said cutting edge is an inwardly beveled surface.--

--17. The tissue cutting device of claim 16 further comprising a dimple in an inner surface of said outer cannula immediately proximal to said tissue-receiving opening, said dimple sized to fit between said inner cannula and said outer cannula.--

--18. The tissue cutting device of claim 1 further comprising a handpiece removably engageable to said outer cannula and supporting said inner cannula, said first hydraulic rotary motor, and said second hydraulic reciprocating motor.--

a2 cont's
--19. The tissue cutting device of claim 18 further comprising a collection trap removably mountable to said handpiece and in communication with said proximal end of said inner lumen.--

--20. The tissue cutting device of claim 19 wherein said collection trap includes a filter element disposed within said collection trap.--

--21. The tissue cutting device of claim 19 further comprising a vacuum source in fluid communication with said collection trap to aspirate tissue through said inner lumen into said collection trap.--

--22. The tissue cutting device of claim 18 further comprising a cover removably engageable to and enclosing said handpiece.--

--23. The tissue cutting device of claim 22 wherein said cover includes:
at least one tang projecting inwardly from an inner surface thereof; and
said handpiece defines at least one engagement notch configured for receiving a
corresponding one of said at least one tang for engaging said cover to said handpiece.--

--24. The tissue cutting device of claim 1 wherein said outer cannula further includes a
stiffening element along a length thereof for increasing the bending resistance of said outer
cannula.--

92 cont's
--25. The tissue cutting device of claim 24 wherein said stiffening element includes a
longitudinally extending rib defined in an outer surface of said outer cannula.--

--26. The tissue cutting device of claim 24 wherein said stiffening element is
substantially diametrically opposite the tissue-receiving opening.--

--27. The tissue cutting device of claim 25 wherein said rib includes a bead adhered to a
surface of said outer cannula.--

--28. The tissue cutting device of claim 25 wherein said rib includes a crimp in said
outer cannula.--

--29. The tissue cutting device of claim 24 wherein said stiffening element includes a layer of rigid material bonded to a surface of said outer cannula.--

--30. The tissue cutting device of claim 29 wherein said material is stainless steel.--

--31. The tissue cutting device of claim 1 further comprising a vacuum source in fluid communication with said inner lumen at said proximal end of said inner cannula to aspirate tissue through said inner lumen.--

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--32. The tissue cutting device of claim 1 further comprising:
an irrigation lumen in fluid communication with said outer lumen; and
a source of irrigation fluid in communication with said irrigation lumen.--

--33. The tissue cutting device of claim 32 wherein said source of fluid includes an anesthetic fluid.--

--34. The tissue cutting device of claim 1 further comprising a dimple in an inner surface of said outer cannula immediately proximal to said tissue receiving opening, said dimple sized to fit between said inner cannula and said outer cannula.--

--35. The tissue cutting device of claim 1 wherein said tissue-receiving opening includes a pair of opposite sides extending longitudinally along said outer cannula, at least one of said

opposite sides defining at least one tooth arranged to engage tissue drawn into said opening when said cannula is inserted into a body.--

--36. The tissue cutting device of claim 35 wherein at least one of said opposite sides defines a plurality of teeth, said teeth angled proximally away from said distal end of said outer cannula.--

--37. The tissue cutting device of claim 35 wherein each of said opposite sides defines a plurality of teeth, said teeth angled proximally away from said distal end of said outer cannula.--

ad cont's
--38. The tissue cutting device of claim 1 further comprising a trocar tip having an engagement hub configured to fit tightly within said distal end of said outer cannula.--

--39. The tissue cutting device of claim 38 further comprising a cutting board disposed within said outer lumen affixed to said engagement hub.--

--40. The tissue cutting device of claim 1 further comprising:
a tubular axle having a distal end and a proximal end; and
a coupler connecting said distal end of said tubular axle to said proximal end of said inner cannula,

wherein said first hydraulic rotary motor is coupled to said tubular axle to rotate said axle and said inner cannula therewith.--

--41. The tissue cutting device of claim 40 wherein said rotary motor includes:
a motor housing having opposite ends and defining a pilot port in fluid communication with said hydraulic system to receive said pressurized fluid;
a rotor rotatably disposed within said housing and connected to said axle extending through said housing; and
bearing surfaces at said opposite ends of said housing for rotatably supporting said axle.--

A2 cont's
--42. The tissue cutting device of claim 41 wherein said second hydraulic reciprocating motor includes:
a hydraulic cylinder having a second pilot port in fluid connection with said hydraulic system to receive said pressurized fluid;
a piston slidably disposed within said cylinder; and
a hollow tube in fluid communication with said proximal end of said hollow axle, said tube engaged to said piston and operably coupled to said first motor to move said first motor as said piston slides within said cylinder.--

--43. The tissue cutting device of claim 42 wherein said second hydraulic motor further includes:
a return spring disposed within said cylinder and biased against said piston to move said piston, said housing and said inner cannula in a direction away from distal end of said outer cannula.--

--44. The tissue cutting device of claim 43 further comprising:
a collection trap in fluid communication with said hollow tube; and
a vacuum source in fluid communication with said collection trap to aspirate tissue
through said inner lumen, said hollow axle and said tube into said collection trap.

--45. The tissue cutting device of claim 1 wherein said second hydraulic reciprocating
motor includes:

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a hydraulic cylinder having a pilot port in fluid connection with said hydraulic system to
receive said pressurized fluid;

a piston disposed within said cylinder and operably coupled to said inner cannula to move
said inner cannula within said outer cannula toward said distal end of said outer cannula;

a return spring disposed within said cylinder and biased against said piston to move said
piston and said inner cannula within said outer cannula in a direction away from distal end of
said outer cannula.--

--46. The tissue cutting device of claim 1, wherein said hydraulic system includes:
a manual switch disposed between an output line and said source of pressurized fluid,
said manual switch operable in a first position to connect said output line to said source, and in a
second position to disconnect said output line from said source;

a first pressure actuated switch disposed between said source of pressurized fluid and said
first motor, said first switch operable in response to fluid pressure in said output line to connect
or disconnect said first motor to/from said source; and

a second pressure actuated switch disposed between said source of pressurized fluid and said second motor, said second switch operable in response to fluid pressure in said output line to connect or disconnect said second motor to/from said source.--

--47. The tissue cutting device of claim 46, wherein said hydraulic system includes a vacuum source.--

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--48. The tissue cutting device of claim 47, wherein:
said vacuum source includes a venturi device; and
said hydraulic system includes a third pressure actuated switch disposed between said source of pressurized fluid and said venturi device, said third switch operable in response to fluid pressure in said output line to connect or disconnect said venturi device to/from said source.. - -

--49. The tissue cutting device of claim 46, wherein:
said second hydraulic motor includes a hydraulic cylinder having a piston operably coupled to said inner cannula, a hydraulic input connected to said second pressure actuated switch and a return spring disposed within said cylinder and operating on said piston against fluid pressure at said hydraulic input; and

said hydraulic system further includes an oscillating switch disposed between said output line and said second pressure actuated switch, said oscillating switch operable in response to fluid pressure in said hydraulic cylinder to connect or disconnect said hydraulic input to/from said second pressure actuated switch.--

--50. The tissue cutting device of claim 2 wherein said cutting edge is an inwardly beveled surface.--

--51. The tissue cutting device of claim 2 further comprising a trocar tip, said trocar tip having an engagement hub configured to fit tightly within said distal end of said outer cannula.--

--52. The tissue cutting device of claim 51 wherein said cutting board is affixed to said engagement hub of said trocar tip.--

--53. The improvement in a cannula according to claim 3 wherein said tooth is angled proximally away from said distal end of said cannula.--

--54. The improvement in a cannula according to claim 3 wherein each of said edges defines at least one tooth, said tooth angled proximally away from said distal end of cannula.--

--55. The improvement in a cannula according to claim 3 wherein each of said edges defines a plurality of teeth, said teeth proximally angled away from said distal end of cannula.--

--56. The improvement of claim 5 wherein said rib includes a crimp defined in said outer cannula.--

--57. The improvement of claim 5 wherein said rib includes a bead adhered to a said outer cannula.--

--58. The improvement of claim 4 wherein said stiffening member is a layer of rigid material bonded to a surface of said outer cannula.--

--59. The tissue cutting device of claim 9 wherein said means for supporting said first motor includes:

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a tubular axle extending through and supporting said first motor, having a distal end operably connected to said proximal end of said inner cannula, and a proximal end operably coupled to said second motor to move said axle and thereby said first motor and said inner cannula in said second direction.--

--60. The tissue cutting device of claim 9 wherein said first motor is a hydraulic motor.--

--61. The tissue cutting device of claim 9 wherein said first motor is a rotary motor and said first direction is rotational.--

--62. The tissue cutting device of claim 9 wherein said second motor is a linear motor and said second direction is reciprocation toward and away from said distal end of said outer cannula.--

--63. The tissue cutting device of claim 62 wherein said second motor is a hydraulic motor.--

--64. The tissue cutting device of claim 63 wherein said second motor includes:
a hydraulic cylinder having a pilot port in fluid connection with a hydraulic system to receive a pressurized fluid;

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a piston disposed within said cylinder and operably coupled to said inner cannula to move said inner cannula within said outer cannula toward said distal end of said outer cannula;

a return spring disposed with said cylinder and biased against said piston to move said piston and said inner cannula within said outer cannula away from distal end of said outer cannula.--

--65. The tissue cutting device of claim 10 wherein:
said proximal end of said hub defines a mating flange; and
said handpiece defines a fitting configured for removable engagement with said mating flange.--

--66. The tissue cutting device of claim 10 further comprising a radio-opaque marker disposed within said outer cannula.--

--67. The tissue cutting device of claim 11 wherein said handpiece includes a housing having a distal end defining a fitting; and

said hub defines a mating flange at said proximal end, said mating flange engageable to said fitting to connect said handpiece to said hub.--

--68. The tissue cutting device of claim 67 wherein said leak path is defined between said housing and said hub.--

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--69. The tissue cutting device of claim 13 further comprising a pressure switch coupled to said source of pressurized fluid to switch from providing pressurized fluid to said motor to permitting fluid to bleed from said motor.--

--70. A tissue cutting device comprising:
an outer cannula defining an outer lumen and a tissue-receiving opening adjacent a distal end of said outer cannula communicating with said outer lumen;

an inner cannula slidably disposed within said outer lumen and defining a inner lumen from an open distal end to an open opposite proximal end, said inner cannula defining a cutting edge at said open distal end operable to sever tissue projecting through said tissue-receiving opening; and

a drive mechanism operably coupled to said inner cannula to move said inner cannula relative to said tissue-receiving opening in said outer cannula, wherein said drive mechanism is substantially composed of a non-metallic material.--

--71. The tissue cutting device of claim 70, wherein said drive mechanism includes:
a first motor operable to rotate said inner cannula; and
a second motor operable to translate said inner cannula.--

--72. The tissue cutting device of claim 71, wherein said first and second motors are
hydraulic motors.--

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--73. The tissue cutting device of claim 70, wherein said non-metallic material is a
plastic.--

--74. The tissue cutting device of claim 70, further comprising a handpiece supporting
said drive mechanism and said outer cannula.--

--75. The tissue cutting mechanism of claim 74, wherein said handpiece is substantially
composed of a non-metallic material.--

--76. The tissue cutting mechanism of claim 75, wherein said handpiece is substantially
composed of a plastic material.--

--77. The tissue cutting device of claim 75, wherein said hydraulic system includes said
vacuum source.--